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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/763,303	01/23/2004	Uttam Ghoshal	089-0008	6524

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EXAMINER	
EARLY, MICHAEL JACOBY	
ART UNIT	**PAPER NUMBER**
3744	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/763,303	GHOSHAL ET AL.	
	Examiner	Art Unit	
	Michael J. Early	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *21 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,11-19 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,11-19 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

Claims 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamoto (US 6,148,626) in view of Barkan et al. (US 3,812,404).

Regarding claim 1, Iwamoto discloses a system (apparatus) for dissipating heat from a high power density device (A, B – load), the system comprising a metal chamber (3 – heat exchanger) placed in a thermal transfer path from the high power density device (as seen in Figure 3); means for cooling (1 – chiller) the liquid (refrigerant; col. 5, lines 6-9; col. 9, lines 46-51; Figure 3), the cooling means being placed at a predefined distance away from the metal chamber (as seen in Figure 3); at least one conduit (2 – primary circuit) traversing the metal chamber and the cooling means in the form of a closed loop (as seen in Figure 3), the conduit circulating the liquid between the metal chamber and the cooling means (see col. 5, lines 6-19; col. 9, lines 46-51; Figure 3); at least one electromagnetic pump (P_1 - pump) for pumping the liquid through the conduit (see col. 5, lines 6-9; col. 9, lines 46-51; Figure 3), wherein heat is transferred away from the high power density device to the cooling means through the liquid contained in the conduit (see col. 5, lines 6-19; col. 9, lines 46-51; Figure 3), the liquid being circulated in the conduit by the electromagnetic pump (see col. 5, lines 6-9; col. 9, lines 46-51; Figure 3).

Iwamoto does not expressly disclose the utilization of a liquid metal or of an electromagnetic pump.

Barkan et al. teach of a rectifier system that is comprised of a semiconductor body and a means for cooling the body. Barkan et al. further disclose that a liquid metal is used as the coolant that is circulated throughout the system (see Abstract). Further disclosed is that the use of liquid metal as a coolant is very beneficial because liquid metals have high thermal conductivity values and thus are easily able to extract the heat generated

by an electronic component. Further disclosed is that liquid metal coolants are capable of effectively operating in a variety of temporal conditions (see col. 4, lines 13-20). In addition, Barkan et al. further disclose the use of an electromagnetic pump used to circulate the liquid metal throughout the apparatus (see col. 4, lines 23-39; col. 5, lines 33-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto by incorporating a liquid metal coolant, as taught by Barkan et al., because of its excellent thermal conductivity properties and ability to effectively operate in a variety of temporal conditions, thus reducing the chances that the system will malfunction due to overheating.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto by incorporating an electromagnetic pump to circulate the coolant throughout the system, as taught by Barkan et al., so to provide the necessary force to overcome the pressure head within the system and to provide a fluid moving means that can quickly respond to the system's cooling needs (see col. 5, lines 33-43), thus ensuring that the circulation of coolant is being performed on a effective and efficient basis and furthermore, ensuring that the system does not overheat.

Claims 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamoto as modified by Barkan et al., and further in view of Mok (US 7,079,394 B2).

Regarding claim 11, Iwamoto discloses the thermal transfer pathway includes a pipe (5 – secondary circuit; Figure 3).

Iwamoto as modified by Barkan et al. do not expressly disclose a heat pipe.

Mok teaches of a cooling device for a foldable, laptop computer that is used to cool heat generating components (e.g., semiconductor chips [12]) (see col. 1, lines 13-21; col. 2,

lines 22-26; Figure 1). Mok further discloses that the cooling system is comprised of heat pipes (10, 11) that are used to transfer heat from the semiconductor chip (see col. 2, lines 47-53; Figure 1). Further disclosed is that the heat pipes can be employed in a variety of arrangements (see col. 3, lines 47-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto as modified by Barkan et al. by incorporating a heat pipes as means of transferring heat within the system, as taught by Mok, because heat pipes are well known for their ability to transfer heat with minimal heat losses, thus increasing the system's overall efficiency.

Regarding claim 12, Iwamoto discloses a system (apparatus) for dissipating heat from a high power density device (A, B – load), the system comprising a pipe (29 – load circuit) placed adjacent to the high power density device (as seen in Figure 4); a heat exchanger (3 – heat exchanger), the heat exchanger containing liquid (see col. 5, lines 6-18; col. 9, lines 46-51), the heat exchanger transferring heat from the pipe to the liquid metal (see col. 5, lines 6-18; col. 9, lines 46-51; Figures 1, 3); means for cooling (1 – chiller) the liquid metal (see col. 5, lines 6-9; col. 9, lines 46-51), the cooling means being placed at a predefined distance away from the heat exchanger (as seen in Figure 3); at least one conduit (2 – primary circuit) traversing the heat exchanger and the cooling means in the form of a closed loop (as seen in Figure 3), the conduit containing the liquid (see col. 5, lines 6-18; col. 9, lines 46-51), the conduit circulating the liquid between the heat exchanger and the cooling means (as seen in Figure 3); heat is transferred away from the high power density device to the cooling means through the combination of the pipe and the conduit (see col. 5, lines 6-18; col. 9, lines 46-51).

Iwamoto does not expressly disclose the utilization of a liquid metal.

As aforementioned, Barkan et al. teach of cooling a semiconductor using a liquid metal as a coolant (see Abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto by incorporating a liquid metal coolant, as taught by Barkan et al., because of its excellent thermal conductivity properties and ability to effectively operate in a variety of temporal conditions, thus reducing the chances that the system will malfunction due to overheating.

Iwamoto as modified by Barkan et al. do not expressly disclose of a heat pipe.

As aforementioned, Mok teaches of a cooling system for a foldable, laptop computer that is used to cool heat generating components wherein the system is comprised of a plurality of heat pipes.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto as modified by Barkan et al. by incorporating a heat pipe, as taught by Mok, because heat pipes are well known for their ability to transfer heat with minimal heat losses, thus increasing the system's overall efficiency.

Regarding claims 13-16, Iwamoto as modified by Mok do not expressly disclose a foldable electronic device and details related.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto as modified by Barkan et al. and Mok by incorporating the cooling device within a foldable laptop computer because these type of electronic devices are deposed within small compartments and must effectively dissipate the heat that is generated, so to ensure that the device does not overheat, thus ensuring that consumers purchase products that are reliable and safe to use.

Regarding claim 17, Iwamoto discloses the high power density device is an integrated circuit (both loads [A, B] are integrated with respective temperature controllers [14]; Figure 3).

Claims 18, 19 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamoto as modified by Mok and Barkan et al.

Regarding claim 18, Iwamoto discloses a method that is capable of being performed by the aforementioned apparatus and is capable of dissipating heat from a high power density device (A, B – load), the high power density device placed adjacent to a pipe (5 – secondary circuit; Figure 3), wherein the method comprising the steps of: a transferring heat from the high power density device to the pipe (see col. 5, lines 6-19; col. 9, lines 46-51; Figure 3), the pipe transporting heat a predefined distance away from the high power density device (see col. 5, lines 6-19; col. 9, lines 46-51; Figure 3); transferring heat from the pipe to a liquid system (3, 2, 1 – heat exchanger, primary circuit, chiller) (as seen in Figure 3); dissipating heat using the liquid metal system (see col. 5, lines 6-19; col. 9, lines 46-51).

Iwamoto does not expressly disclose of a heat pipe.

As aforementioned, Mok teaches of a cooling system for a foldable, laptop computer that is used to cool heat generating components wherein the system is comprised of a plurality of heat pipes.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto by incorporating a heat pipe, as taught by Mok, because heat pipes are well known for their ability to transfer heat with minimal heat losses, thus increasing the system's overall efficiency.

Iwamoto as modified by Mok do not expressly disclose the utilization of a liquid metal.

As aforementioned, Barkan et al. teach of a method and apparatus for cooling semiconductors by using a liquid metal as a coolant (see Abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Iwamoto as modified by Mok by incorporating a liquid metal coolant, as taught by Barkan et al., because of its excellent thermal conductivity properties and ability to effectively operate in a variety of temporal conditions, thus reducing the chances that the system will malfunction due to overheating.

Regarding claim 19, Iwamoto discloses the step of transferring heat from the liquid loop system to a heat sink (1 – chiller) (see col. 5, lines 6-19; col. 9, lines 46-51; Figure 3).

Regarding claim 23, Iwamoto as modified by Mok and Barkan et al. disclose the recited limitations above in claims 13-15.

Response to Arguments

Applicant's arguments, see Remarks, filed 12/21/06, with respect to the rejection(s) of claim(s) 1, 11-19 and 23 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Iwamoto (US 6,148,626), Barkan et al. (US 3,812,404) and Mok (US 7,079,394 B2).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wang et al. (US 6,771,498 B2) teach a cooling system for hinged portable devices that employ heat pipes as a means of transferring heat within the system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Early whose telephone number is (571) 272-3681. The examiner can normally be reached on Monday - Friday, 7am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler can be reached on (571) 272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJE
3/30/07

Michael J. Early
Patent Examiner
Art Unit 3744

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SUPERVISORY PATENT EXAMINER